

MODIS Phycoerythrin Concentration (MOD 31)

Product Description

This product consists of three parameters which give the concentration of one of the major algal pigment groups in ocean water, Phycoerythrin. The three parameters are Phycoerythrobilin Concentration, Phycourobilin Concentration, and Constituent Inherent Optical Properties (CDOM absorption, chlorophyllous absorption, and particulate backscatter). These quantities are provided for Level 2 at 1-km spatial resolution daily and for Level 3 daily, 8-day weekly, monthly, and yearly at 4.6-km, 36-km, and 1° resolution. The product is valid only for clear-sky ocean pixels.

Phycoerythrin is one of three major algal pigment groups found in marine phytoplankton and bacteria (Bidigare, 1990). The phycoerythrins are further subdivided into phycourobilin-rich (PUB) and phycoerythrobilin-rich (PEB) phycoerythrins. This algorithm retrieves both PUB- and PEB- rich cases. Phycoerythrin is a chlorophyll accessory pigment and serves to receive photosynthetically usable light in the 480-505-nm and 540-560-nm ranges. It is used to infer the global extent of phycoerythrin-bearing phytoplankton such as cyanobacteria, which are nitrogen-fixing and thus provide information on the nitrogen cycle. Used in conjunction with phytoplankton chlorophyllous pigment, the apparent species diversity of the oceans can be inferred.

Research and Applications

One of the intended uses of the phycoerythrin data product is to allow scientific investigators to study the global distributions of the phycoerythrin pigment and, in so doing, to allow definition of the diversity of phycoerythrin-bearing species such as cyanobacteria. When used in conjunction with chlorophyll distribution, phycoerythrin determination allows global phytoplankton species variability studies.

Data Set Evolution

The phycoerythrin retrieval algorithm requires water-leaving radiances generated from the incident solar irradiance, the total backscatter, and the total absorption of sea water. The PUB and PEB param-

eters are retrieved by a sequential-convergent-iteration method (Gordon *et al.*, 1988) that uses five independent bands. MODIS band 10 (488 nm) and band 12 (551 nm) correspond to the peaks of the PUB and PEB phycoerythrins. The major assumption for the algorithm is that the pigment-specific absorption-coefficient spectral model used is applicable for the oceanic province where the satellite image was acquired. The algorithm will be validated by ship and airborne laser-induced and water Raman-normalized fluorescence measurements.

Suggested Reading

- Bidigare, R.R. *et al.*, 1990.
- Culver, M.E., and M.J. Perry, 1994.
- Gordon, H.R. *et al.*, 1988.
- Hoge, F.E., and R.N. Swift, 1986.
- Hoge, F.E., and R.N. Swift, 1990.
- Hoge, F.E. *et al.*, 1999a.
- Hoge, F.E. *et al.*, 1999b.

MODIS Phycoerythrin Concentration Summary

Coverage: Global ocean surface, clear-sky only

Spatial/Temporal Characteristics: 1 km/daily (Level 2); 4.6 km, 36 km, 1°/daily, 8-day, monthly, yearly (Level 3)

Key Science Applications: Global phytoplankton species studies, ocean productivity models

Key Geophysical Parameters:
Phycoerythrobilin-rich (PEB) and phycourobilin-rich (PUB) phycoerythrins

Processing Level: 2, 3

Product Type: Research, at-launch

Maximum File Size: 102 MB (Level 2); 640 MB binned, 134 MB mapped (Level 3)

File Frequency: 144/day (Daily Level 2); 2/day (Daily Level 3), 2/8-day (8-day Level 3), 2/month (Monthly Level 3), 2/year (Yearly Level 3)

Primary Data Format: HDF-EOS

Browse Available: 36 km sample imagery available at the Goddard DAAC (Level 3 only)

Additional Product Information:
<http://modis-ocean.gsfc.nasa.gov/dataproduct.html>

DAAC: NASA Goddard Space Flight Center

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